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arguments for a minimum wage, a cost of living standard, relative rating, profit sharing and other like devices. But none of these by itself is adequate nor all of them combined. There must also be a recognition of the fact that labor is one of the contributors to a joint product, but that the part it has produced is indeterminate. Instead of deluding ourselves with the belief that it can be ascertained and labor then be given the amount of the product to which it has a right, we should concern ourselves more over the effective functioning of industry. Labor is coming more and more to appreciate its potential power, and is constantly more critical of the weaknesses of management. Such experiments as industrial councils and other devices which give to workers a larger share in management

are a partial solution of the problem.

Only partial, however. No solution is final or complete even for a brief time. The reasons that the present trouble is so acute is that conditions change so rapidly—more rapidly than do our ideas, our theories. Thus the very success of works councils in bringing together employer and employee in a given industry may lead them to recognize their gain in restricting output and in then raising prices to their mutual advantage. Such a move means higher wages in that industry, at least for a time, but the higher price for that product means a lower real wage for every purchaser of it. If such restrictions in output became general, productivity as a whole would be seriously curtailed. No one theory gives the answer today, and no solution will be final.

The Relation Between Wages and National Productivity

By GEORGE SOULE

The Labor Bureau, Incorporated

AS the pursuit of economic science passes from qualitative analysis to the assemblage and interpretation of quantitative data, students grow more wary of enunciating its "natural laws." Even the laws of the few exact sciences such as physics and chemistry are now suffering a series of shocks from the acquisition and analysis of new facts; and the followers of the still slender trail of economics through the unexplored jungles of human behavior do well to assume a certain diffidence. The present writer has no intention of discussing here the productivity or any previous theory of wages, except as such inadequate statistical data as we have may throw light on them. Likewise, it is incautious to set down any im-

mutable "principles," new or otherwise, for the use of employers, unions or arbitrators in the determination of wage-rates. We have learned from the modern psychologists that principles, so-called, are often little more than weapons seized or defenses thrown out in the presence of conflicting desires, and that, while they are often of a high temporary utility in the heat of battle, they sometimes become embarrassing with a change of terrain or of relative power.

Whatever may be the underlying laws, the surface phenomena surrounding the determination of basic wage-rates are usually highly controversial, and suggest that there is little to influence the result save the respective power of the two parties immediately

concerned. There are, to be sure, moments when the human animal wearies of conflict, and improvises a machinery which will preserve his muscles for more fruitful exercise. There arise arbitral courts of one kind or another, and these courts, as instruments whose purpose is to avoid battle, look about for some guide to decision upon which the reason can rest. Yet most successful arbitrators are keenly aware that they are not interpreting abstract principles of economic justice, or applying well codified laws to specific circumstances. They are, in the main, engaged in the diplomatic and political task of following a balance of power, and it is only within the limits of the territory wherein all parties concerned will consent to abandon the appeal to battle that they can in the long run successfully apply their reason. This may be regrettable, but it is inevitable in a state of society where economic forces are constantly in flux and moral judgments concerning them are not universally held. A criminal judge is on sure ground when he presides over a trial for murder, because murder is widely held in abhorrence and the law concerning it is clear. But an industrial judge who is trying to decide whether wages shall be reduced 10 per cent or 3 per cent has no such certainty. Without a fairly well defined balance of economic power, no arbitrator has any assurance of the limits within which his judgment may operate.

The progress toward basic principles in wage determination is therefore not a sudden leap to a complete set of scientific laws or a code of industrial justice, but a gradual substitution of the more nearly scientific for the less scientific, of the more nearly just for the less just. The area of possible discrimination grows as the communal interest receives larger emphasis than

the particular interest, and such principles as come into use arise, as a rule, in specific cases as a result of the evidence and the arguments introduced by one side, corrected by the evidence and arguments introduced by the other, and tempered by the arbitrator's estimate of the needs and desires of both and of the rest of the public. The considerations to be advanced here have been introduced in support of the contentions of unions in wage disputes. It is with no belief that they are complete or final that they are now summarized, but only in the hope that they may assist the slow development of science and justice.

ECONOMIC IMPLICATIONS OF THE COST OF LIVING PRINCIPLE

One of the most frequently used principles in recent wage adjustments has been that of the alteration of wages by reference to an index of retail prices or "cost of living." This principle was established during the War when prices were rising, and is the reflex of arguments advanced in behalf of labor. The feeling that the purchasing power of wages should not decrease, especially in a period of prosperity, could be counted upon in most arbitrators and fair-minded employers, and it was almost universally invoked. In making this appeal few union advocates had any intention of admitting the converse, that the purchasing power of wages should not increase, especially when a favorable opportunity for such increase should be presented by a falling retail price level. Certainly not many members of the rank and file understand or see any justice in a reduction of money wages simply because a government or other statistical agency announces a fall in prices.

Wage earners are just as likely as others to spend the whole of their in-

comes from week to week, and the practical result of falling prices is a slow and almost imperceptible rise in the standard of living. The housewife is spending just as much after the drop as before; the appearance of slightly better foods on the table, or the purchase of a few long-needed household utensils or articles of clothing is not noted with statistical accuracy by the family. Employers, however, were quick to seize on the "principle" of the cost of living adjustment in demanding wage reductions during the period of depression. Such reductions were in reality necessitated by the financial condition of business enterprises, or, if not necessary, were made possible by the shift of economic power. But the cost of living argument presented an aspect of mechanical justice to the process. One employer, for example, recently summed up the case against a union as follows: "After everything is said, it all comes down to this—we had to increase wages when the cost of living was going up, and now that the cost of living is going down the men should take their medicine."

The feeling of the wage earners, strong as it is, that such a process is unjust, is not sufficient to convince a neutral. This feeling may, however, be converted into a valid argument if we investigate the economic implications of the cost of living principle. At any given time the wage permits the purchase of certain articles and services in certain amounts. Budget studies determine roughly what these items and quantities are. The cost of living index is weighted according to the importance of the various items in the budget. If the wage is continually raised or lowered only in direct ratio to the changes in the cost of living index, it is assumed that the physical goods and services consumed by the worker's family should remain con-

stant year after year. Such a principle applied to the whole body of wage earners would stabilize the per-capita purchasing power of one of the largest classes of the population. But, at the same time, we assume that the physical productivity of the nation shows an increasing trend on account of the progress of technique and industrial organization, and that this increase takes place at a more rapid rate than the increase in population. Who, then, would absorb the additional goods produced, if there were no expansion in the purchasing power of the wage earner and his family? Either an increasing differential would be set up between the standards of living of economic classes, or else a larger part of the population would be sustained in non-productive occupations.

It might be argued that the increasing productive power of the nation need not be utilized for consumers' goods, and that it may be applied solely to a piling up of capital goods. Such an argument is, however, a palpable absurdity if the process indicated is to continue for very long. How could there be any permanent inducement for the accumulation of capital goods if the new capital were never to be used for the production of goods to be consumed?

WAGE INQUIRIES UNDER PRODUCTION INDICES

These reflections open up at once certain avenues for statistical inquiry. What is the rate of increase in production, and in production per capita of the population? What share of the product have the wage earners consumed in the past? Has that share tended to increase, to decrease, or to remain constant?

A number of indices of physical production have been developed and of these, the two published by Walter

W. Stewart of Amherst College¹ and Edmund E. Day of Harvard University² are the most complete, although the basic data are not yet full enough to enable the calculation of a production index which is wholly satisfactory. These two indices use essentially the same data, with the exception that Stewart's includes transportation, while Day's does not. Their long-term trends are almost precisely the same, though the secular trends due to the business cycle vary more widely. If we derive an index of per-capita production from each of these indices by dividing it by an index of population, we discover that physical production has increased more rapidly than the population since 1899, the starting point of the production indices. The slope of the per-capita production curve is a little under 2 per cent, and the net rise, 1899 to 1920, is about 30 per cent.

To investigate the wage earners' share in the physical product is a more difficult matter. We may begin with the share of value produced which has been received by the wage earners in manufacturing industry, using the figures of the Census of Manufactures for our calculations. The value produced is indicated by what the census terms "value added by manufacture." This is the sum obtained by subtracting the cost of raw materials from the net sales. It therefore includes the total amount available for distribution in rent, interest, profits, salaries and wages, and cancels out any duplication in the census figures due to the fact that one factory may use as materials the product of another

manufacturing establishment. The percentage of this amount paid in wages will indicate the share of manual labor in the value-product, and the extraction of this percentage for a number of census years will give an indication as to how constant labor's share in the value-product remains. This calculation shows that the share of labor, from 1899 to 1914, remained almost as constant, on the average, as if it had been determined with mathematical exactness by a supreme economic authority. The percentage of "value added by manufacture" received by wage earners in all industries runs as follows:

1899	1904	1909	1914
<hr/> 42	<hr/> 42	<hr/> 40	<hr/> 41

Similar percentages for each of the fourteen main industrial groups also show a striking uniformity throughout the period. The percentages, of course, are widely different among the several groups. The only groups, however, which show changes of more than three points in the percentage during the fifteen-year period are leather and its finished products, and vehicles for land transportation, in both of which the share of labor fell seven points. This drop was doubtless due in both cases to extraordinary changes in the characteristics of the industry, involving the addition of immense capital investment and the very rapid introduction of machine processes, which markedly reduced the number of wage earners necessary for a given volume of production.

Application of the same analysis to even smaller industrial groups, such as rolled, forged, and other classified iron and steel products, shows little variation from year to year in the percentage received by wage earners. Most of the variation occurs in the year 1914, when labor charges in some

¹ "An Index Number of Production" by Walter W. Stewart, *American Economic Review*, March, 1921.

² "An Index of Physical Production" by Edmund E. Day, Harvard University Committee on Economic Research, 1921.

groups ran up to a higher percentage than usual on account of the industrial depression.

FAILURE OF LABOR TO SHARE INCREASE IN PER-CAPITA PRODUCTION

We are now ready to draw a tentative conclusion. If the per-capita product of industry increased steadily, and if the share of all the wage earners in the product remained nearly constant, the real wages of the individual wage earner ought to have increased in direct ratio to the increase in per-capita production. It may be objected that the index of production is an index of physical goods, whereas the calculations as to the share of the product received by labor are in terms of money, which does not retain a constant relation to physical goods on account of shifting price levels. To this objection we may answer that in obtaining our ratio of wages to product we used money for both terms, and therefore any change in the general price level from time to time is canceled out in the percentage. This answer is valid only on one hypothesis, namely, that throughout the period factory prices maintained a constant ratio to retail prices, or, to put the matter in another way, in basing our estimate of the share of the product received by labor on the ratio of wages to "value added by manufacture," we were basing it on the assumption that the purchasing power of a dollar in the hands of a wage earner changes from time to time in exactly the same way as the purchasing power of a dollar paid to a manufacturer for his goods. This assumption is true only if the curve of retail prices is approximately the same as the curve of factory prices.

Now, studies of the actual course of real wages made by comparing an index of average money wages with the index of the retail prices of food over a period

of years are familiar, and they show uniformly that, if food prices may be taken as a sample of retail prices in general, real wages have materially decreased since 1896. The study of Paul Douglas in the *American Economic Review* of September, 1921, for instance, proves that according to this method of calculation, real wages have decreased over 30 per cent in the past twenty years. This conclusion becomes all the more startling in the light of the above analysis. If real wages had increased during this period in the same percentage as per-capita production increased, they would have risen 30 per cent, instead of falling 30 per cent. In other words, real wages in 1918 were 85 per cent lower than they would have been if the tentative conclusion in the preceding paragraph were correct.

It is objected that such studies as those of Mr. Douglas suffer from the fact that they are based largely on wage-rates rather than on full-time earnings, which would include overtime and would take account of continuity of employment. In order to avoid this criticism, and to relate the estimate of real wages more closely to our previous figures, we have derived the per-capita yearly wage from the census figures by dividing the total wage bill of each year by the average number of wage earners for that year, and have compared the index of money wages thus calculated with the index of retail food prices.³ The result shows that real wages, measured in this way, fell about 10 per cent between 1899 and 1914. The conclusion is therefore inescapable that, unless there is some radical error in the census figures, or unless food prices do not accurately represent other retail prices,

³ While this method is not statistically correct for obtaining the actual money wage of the full-time employe, it ought to be accurate enough to establish a trend.

the margin between factory prices and retail prices has been rapidly increasing. Wages measured in terms of prices at the factory have advanced, while wages measured in terms of prices in the retail stores have gone down rapidly.

MODIFICATION OF WAGES THROUGH A SMOOTHED PRODUCTIVITY INDEX

Thus is developed an interesting bit of evidence tending to prove a hypothesis that has already been reached in other ways. Those engaged in the distributive process have apparently been receiving during the past twenty years an increasing share of the national product. They have been exacting a larger return in goods for every billet of steel and yard of cloth produced. They have not only absorbed their former share of the production of the nation, but more too. While manufacturing industry has been increasing its efficiency, distributive service and the national overhead have thus suffered a loss in efficiency of sufficient magnitude to eat up more than the saving made in manufacture. This encroachment has been chiefly at the expense of the wage earners.

The wage earner may argue justly that he is not responsible for any decrease in distributive efficiency or for any increase in the reward of non-productive elements of society. He can make a strong case for the proposition that he should not at any rate receive a smaller per-capita share of the national product than he has received in the past. If this share is to be maintained, the purchasing power of wages must be increased in direct ratio to the increase in per-capita physical production. This means that wages

must be modified not only by a cost of living index, but also by a smoothed productivity index. If such a course were adopted, the task of resisting the encroachments of distributive inefficiency would be transferred to the other elements engaged in production, who are better able to bear the burden of such a battle. Moreover, the efforts of employers and of those who furnish them with capital would be better engaged in organizing the channels of distribution than in resisting labor unrest caused by a falling standard of living and an unnecessarily high level of retail prices.

This study of the relation of wages to national productivity, elementary and incomplete as it is, suggests further fruitful lines of economic inquiry. A fuller elaboration of production indices for special industrial groups is desirable. Perhaps a different method of making and using price indices would be advisable. The^{*} present price indices have been founded largely on the assumption that shifting price levels are to be explained chiefly by the quantity theory of money, and that therefore all prices show about the same trend in the long run. Evidently this is not the case. A general wholesale price index gives us no information, for instance, as to whether the percentage differential between prices at the factory and jobbers' prices is increasing or decreasing. Should not price indices be further elaborated so as to indicate the toll exacted by different stages of the processes of production and distribution? And studies of economic waste might be made even more fruitfully in the area of distribution than in the area of production.